An Intelligence Challenge

Verification Implications of Commercial Satellite Imagery (U)

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High-resolution commercial satellite imagery (CSI) products are expected on the global market within a year. With resolutions as high as 1 meter, their imagery could be used as an "international technical means" in treaty verification. CSI will also have threatening applications, with implications for the US Intelligence Community (IC).

The United States has monitored national security interests with its own imagery collection system, but the rest of the world has not had this luxury until now. The availability of 1-meter data presents problems for US policymakers unaccustomed to the idea of America being scrutinized by other nations. Policymakers have to decide whether it is important to protect American citizens or to contribute to international verification efforts. For CSI to succeed at verification and thereby increase international stability, the United States will have to become more tolerant of this potential worldwide intelligence source. Another troubling development is that the IC can no longer assume that American citizens and world leaders will blindly trust US intelligence revelations. The IC will have to be more forthright in providing information on world events and ready to face unsubstantiated and unqualified claims. US intelligence efforts can expect commercial researchers to constantly challenge the IC's credibility.

Verification Paradox

Technical means that monitor compliance with treaties have the potential of becoming the same technical means used for targeting weapons more accurately. This situation is the verification paradox. Verification tools are only as scrupulous as those who use them. Few readily notice the "irony that the machines that spy on nuclear weapons also are used for guidance systems to deliver those same weapons with deadly accuracy."[1] The same holds true for CSI systems that have resolution capabilities sufficient for targeting. Even in the most well-meaning of agreements, "the same technology, the same capability, can be used to help combat and to help negotiate agreements with...opponents."[2]

The emergence of high-resolution CSI systems could create as many problems as solutions for the IC. Whether CSI can contribute to deterrence may lie with the US Government's ability to appreciate potential implications *before* they occur. Policymakers and intelligence planners have to face the implications and potential problems of using commercial satellite imagery for treaty verification.

International Monitoring Proposals

Proposals for using CSI for international monitoring already exist. In 1993, Dr. Bhupendra Jasani, a Senior Research Fellow at the

Department of War Studies of King's College in London, submitted one of the first. *Jane's Intelligence Review* featured Dr. Jasani's "The Value of Civilian Satellite Imagery" in its May 1993 issue. Jasani proposed several concepts for CSI monitoring of peacekeeping using SPOT imagery.[3] Dr. Jasani's proposal comes from a European perspective, which gives insight into the foreign expectations for satellite reconnaissance. The proposal also comes from a perspective where high-resolution satellite reconnaissance capabilities are not a given, as they are in the United States.

Jasani envisioned making imagery data "freely available to member states," and "[carrying] out verification and cease-fire monitoring tasks under the UN umbrella," or even having these functions directly controlled by the UN, under the Security Council, without national or regional influences. [4] These proposals, however, cut off potential business opportunities to outside imagery suppliers. International lobbying and competitive "blocs" could influence the selection of CSI contacts by those wishing to foster their own national CSI industry sales. Suppliers, such as the United States, with more capable imagery systems may find themselves closed out of potential overseas markets. The IC might submit that it has more experience with worldwide monitoring, and therefore is better suited to control CSI tasking.

Laurence Nardon submitted a somewhat different proposal to the London-based Verification Technology Information Center (VERTIC) in 1995 to use CSI for monitoring known nuclear weapons testing areas

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around the world. Nardon believes that:

> *Satellite images could provide proof that tests were being prepared and allow for test sites to be localized far more precisely than seismic measurements. What is more, they would have a stronger political impact on public opinion when published than other verification methods.*[5]

To untrained public opinion, however, photographic images constitute "undeniable proof." This "seeing is believing" philosophy is dangerous if anomalous assessments are allowed to affect national policy decisionmakers. Trained imagery interpreters, exploitation specialists, and analysts are the only ones qualified to judge that what is perceived in an image is, in fact, real. Carefully planned deception programs can wreak havoc on image-based monitoring proposals.

Nardon, nonetheless, proposes a viable tool for determining the status of nuclear test sites. The concept was originally proven in 1964, when a KEYHOLE-4A US photo-reconnaissance satellite confirmed China's first atmospheric nuclear test.[6] With a resolution of approximately 10 feet (2.4 meters) the KH-4A was a foreshadowing of the anticipated capabilities of the commercial imaging satellites expected by the year 2000.[7] These capabilities are commercially possible, and expensive retasking might not be necessary with numerous satellites providing revisit times of under a week.

The Nardon proposal requires 120-by-150 km SPOT images, which cover broader area then Jasani's higher resolution 60-by-40 km proposal. Fewer images at lower resolutions might reduce overall costs, but they also make detection of key indicators difficult, if not impossible. Timeliness is another issue. In 1989, the Carnegie Endowment needed only 25 working hours to identify and report on the suspected locations of French IRBMs at Plateau D'Albion using commercially available SPOT imagery.[8] At nominal cost, routine, wide-area SPOT imagery orders cost $3,300, but delivery takes several weeks. The only way to ensure quicker delivery is by paying heavy rush order premiums, driving up Nardon's original cost estimates.[9]

Libyan Case Study

Interpretations of CSI have already demonstrated the ability to detect, identify, and characterize treaty violations. In 1987, US intelligence collection systems detected a Libyan chemical weapons facility at Rabta.[10] In 1990, US intelligence sources then noted that a "fire on March 14 at the Rabta plant had caused extensive damage, knocking it out of operation" for what some US officials believed would be at least a year.[11] This assessment, however, was challenged by CSI. SPOT imagery analysts concluded that "*there may have been a small fire in a building some 800 meters from what is thought to be the main factory... [but]*

Ten-meter resolution SPOT imagery. (Reprinted courtesy of SPOT Image Corporation.)

the main plant seemed to be undamaged."[12] With this revelation, SPOT demonstrated that it, and potentially all subsequent CSI assessments, could publicly upstage the credibility of an IC assessment.

Threatening Applications

The threat posed by CSI was put to the test by several studies which judged its effectiveness for intelligence collection and targeting. As previously noted, the Carnegie Endowment for International Peace was one of the first with its "A Peek at the French Missile Complex."[13]

The Endowment was also testing SPOT's Open Skies sales policy. If SPOT sold imagery of sensitive areas in its own country, it would probably sell imagery of other nations without restriction.

In a very short time, imagery interpreters at the Carnegie Endowment identified controlling headquarters, security fences, perimeter roads, barracks, bunkers, and 18 probable launch silos. According to the Endowment, the imagery resolution was good enough to detect recent activity in areas that were subject to "deliberate clearing."[14] The study commented that with "seven-meter data...significant military detail [such as]...large vehicles...would begin to appear."[15] The Carnegie Endowment was convinced that even 10-meter data imagery is usable in an intelligence capacity over denied areas, and sufficient to target weapons.[16] With 1-meter resolution data, the applications increase exponentially.

Dr. Jasani conducted a second study in 1993 of the Golan Heights which detected, identified, and analyzed military positions on both sides of the Israeli-Syrian cease-fire line. The results were impressive. Radars, anti-aircraft gun sites, barracks, airfields, aircraft shelters, ammunition storage areas, helicopter pads, SAM sites, perimeter fences, liquid storage areas, and roads all were distinguishable with 10-meter resolution SPOT imagery. The analysis went as far as to characterize construction methods and activity levels:

> *Possible helicopter pads...can also be seen. These have different surfaces [one]...is probably made from concrete and...[the other] is probably unsurfaced. The runway...is likely to be under repair as there are no tyre [sic] marks or bright, sharp edges.*[17]

Distinguishing these characteristics again demonstrates that CSI is useful for intelligence collection and targeting weapons. SPOT-quality imagery could not, however, target precision-guided munitions against individual pieces of military equipment, but requirements for targeting nuclear-tipped weapons need not be precise. Therefore, foreign military combatants have commercial access to a collection source sufficient for nuclear weapons targeting.

Threat Scenarios

The most threatening application of CSI is nuclear missile targeting against targets within the United States. Fortunately, emerging and hostile adversaries do not possess intercontinental delivery systems. The open nature of the United States precludes the need for satellite imagery for targeting most US targets. There are, however, a few denied areas in the United States. Satellite imagery might be required if adversaries desire targeting sensitive US military facilities where access is denied.[18] CSI may be used for a terrorist attack against one of these facilities. The immediate concern for policymakers, intelligence planners, and tactical commanders is assessing if foreign customers are buying commercial satellite imagery of sensitive facilities within the United States.

An attack against US forces stationed abroad does not require advanced delivery systems. This was made clear during Operation Desert Storm's Iraqi Scud attacks. If these attacks had been made with a nuclear-tipped weapon, the toll would have been catastrophic. Commercially available 10-meter resolution SPOT imagery allows targeting for short-range delivery systems against stationary targets. Fortunately, US engagement forces can be highly mobile, requiring attackers to have more frequent targeting updating than is currently available. Future CSI constellations, however, might provide updates that mobile forces cannot evade.

A more likely scenario is an adversary using CSI to target forces while they are staging. Targets might include logistic heads, rendezvous points with other coalition forces, exercises, buildup periods before war, or even during a postconflict withdrawal of forces. CSI provides over-the-horizon targeting information, allowing adversaries to strike US forces with nuclear weapons while they are still far enough away to spare damage to their own forces. The main prerequisite is that adversaries possess delivery systems in their operational inventory.

Conclusions

Although commercial imagery systems can detect visual indicators, they can never replace existing national technical means of treaty verification. Commercial imagery will augment existing systems by increasing the number and timeliness of satellite observations. Imagery technology is readily available, the need among nonsuperpower nations exists, and the systems are poised for launch. By facilitating early detection of threats, CSI can contribute to deterrence. As an international technical means of monitoring treaties, CSI can increase confidence in international agreements without putting inspection personnel in harm's way. International technical means can reveal mutual capabilities between opponent nations, thereby reducing doubts and fears of possible surprise attacks.

With the advent of greater numbers of higher resolution CSI systems, the possibility that commercial imagery will be used for military targeting purposes increases. Existing 10-meter resolution SPOT imagery is already adequate for targeting nuclear weapons. The primary demand for high-resolution CSI will probably be for building military targeting packages. Only after that priority is satisfied will nations use imagery to monitor treaty compliance. The IC should expect no less from nations seeking to preserve their own security.

No matter how good the resolution of CSI becomes, reliable imagery intelligence will always require interpretation, exploitation, and analysis, fused with other sources. Photo-interpreters, exploitation specialists, and imagery analysts require adequate training and equipment before image data constitute imagery intelligence. The fact that 1-meter resolution imagery will become readily accessible on the global market does not mean that customers will necessarily know how to turn that imagery into military intelligence. Determining which imagery system will most effectively satisfy intelligence requirements depends on the competence and experience of the photo-interpreters, exploitation specialists, and imagery analysts.

A greater threat to the IC may come from anomalous reporting based on commercially available satellite images. Untrained customers increase the risk of publishing misleading reports. Customers may have never seen satellite images before, yet will be ready to report what they believe they see. Policymakers will demand answers from the IC, forcing responses to a flood of unsubstantiated reporting. If anomalous reporting is sufficient to overwhelm the IC's ability to respond, it may seriously degrade the effectiveness of US intelligence efforts to conduct comprehensive verification strategies.

NOTES

1. "Spy Machines," *NOVA*, No. 1412, 13 October 1987.

2. Kosta Tsipis, MIT Physicist, on "Spy Machines," *NOVA*, No. 1412, 13 October 1987.

3. Dr. Bhupendra Jasani, "The Value of Civilian Satellite Imagery," *Jane's Intelligence Review*, Vol. 5, No. 5, May 1993, p. 235.

4. *Ibid.*, p. 235.

5. "Nuclear Monitoring by Satellite," *Indigo Publications Intelligence Newsletter*, 27 April 1995, p. 2.

6. Philip J. Klass, "CIA Reveals Details Of Early Spy Satellites," *Aviation Week & Space Technology*, 12 June 1995, p. 171.

7. Kevin C. Ruffner, Central Intelligence Agency, Center for the Study of Intelligence, *CORONA: America's First Satellite Program* (Springfield, VA: National Technical Information Service, 1995), p. xv.

8. Carnegie Endowment For International Peace, *GRAYSCALE*, Imagery Analysis, 4 January 1989, pp. 3-5.

9. "Special arrangements have been made to get SPOT imagery (to the media) within a few days for fast-breaking stories. However, this kind of delivery cannot be routinely provided and is expensive. The delivery time for civilian imagery is usually several weeks or more, even for imagery that has already been acquired and archived." From US Congress, Office of Technology Assessment, *The Future of Remote Sensing From Space: Civilian Satellite Systems and Applications*, OTA-ISC-558 (Washington, DC: US Government Printing Office, July 1993), p. 153, Table C-3 notes.

10. David B. Ottaway, "Behind the New Battle with Libya," *The Washington Post,* 8 January 1989, p. C4.

11. Michael R. Gordon, "US Says Fire At Libya Arms Plant May Be A Hoax," *The New York Times*, 31 March 1990, p. 3.

12. "Small Fire, Much Smoke," *The Economist*, 314, No. 643, 31 March 1990, p. 42.

13. Reprinted in "A Peek at the French Missile Complex," *Bulletin of the Atomic Scientists*, 45, No. 7, September 1989, pp. 20-23.

14. Carnegie Endowment For International Peace, *GRAYSCALE, Imagery Analysis*, 4 January 1989, p. 3.

15. *Ibid.*, p. 4.

16. *Ibid.*, p. 5.

17. Bhupendra Jasani, "The Value of Civilian Satellite Imagery," *Jane's Intelligence Review 5*, No. 5 (May 1993), p. 238.

18. US Congress, Office of Technology Assessment, *The Future of Remote Sensing From Space: Civilian Satellite Systems and Applications*, OTA-ISC-558 (Washington, DC: US Government Printing Office, July 1993), p. 164.